

Name: \_\_\_\_\_

Teacher: \_\_\_\_\_

**DO NOT OPEN THE EXAMINATION PAPER UNTIL  
YOU ARE TOLD BY THE SUPERVISOR TO BEGIN**



# Mathematics 3201

*SAMPLE MID-YEAR EXAMINATION #1  
January 2015*

Value: 70 Marks  
Duration: 2 Hours

## General Instructions

This examination consists of two parts. Both parts are contained in this booklet and further general instructions are provided on appropriate pages.

### **Part I – Selected Response (35 marks)**

Select the letter of the correct response from those provided. EITHER shade the letter on your computer scorable card OR place the letter in the blank provided on your Multiple Choice Answer Sheet, whichever format is being used by your school for this exam. **Do ALL questions in this section.**

### **Part II - Constructed Response (35 marks)**

Answer ALL questions fully in the space provided, showing all work.

## Student Checklist

*The items below are your responsibility. Please ensure that they are completed.*

- Write your name and teacher's name on the top of this page.
- Write your name, teacher's name, course name and number on the Part I answer sheet.
- Check the exam to see that there are no missing pages.

**ALL MATERIALS MUST BE PASSED IN WITH THIS EXAM.** Use your time wisely. Good luck!

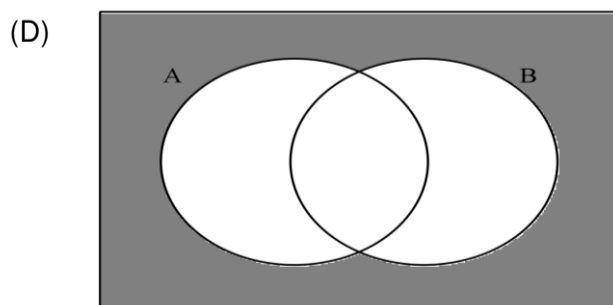
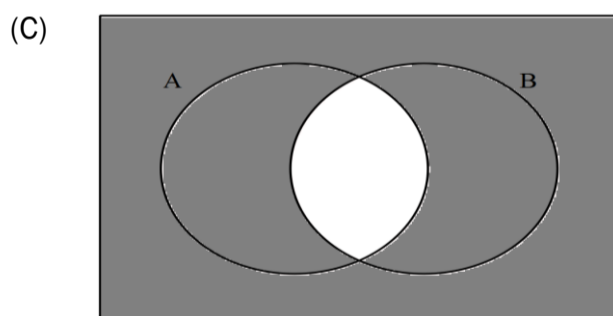
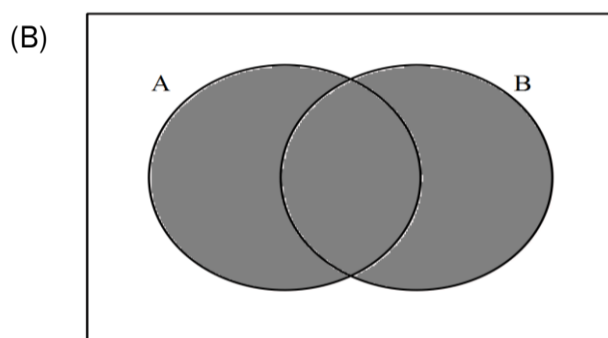
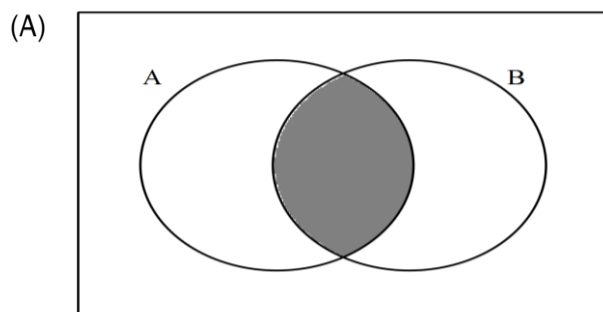
**PART I**  
**Total Value: 35 marks**

Answer all items. Shade the letter of the correct answer on the computer scorable answer sheet or place the letter in the blank provided on your Multiple Choice Answer Sheet.

1. Which is an empty set?

- (A) prime numbers that are even
- (B) rectangles that are squares
- (C) weeks that have exactly 4 days
- (D) years with 366 days

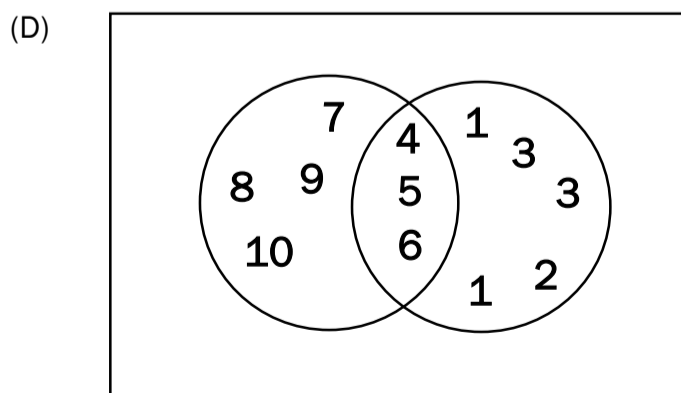
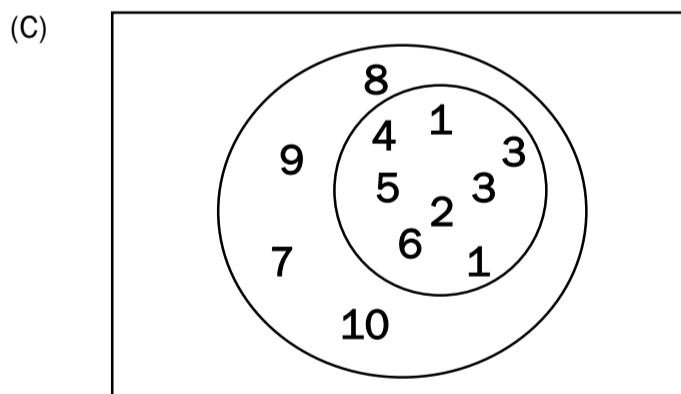
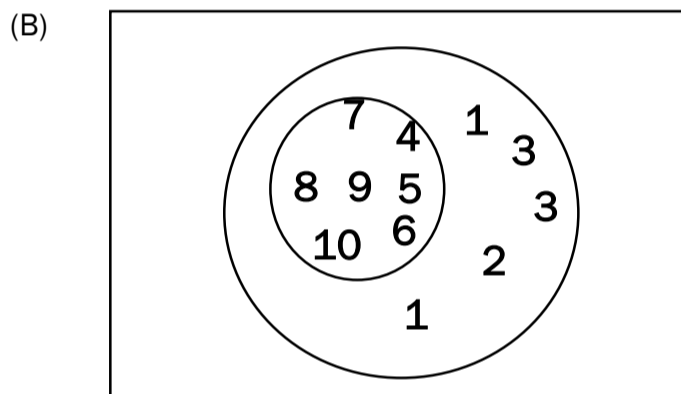
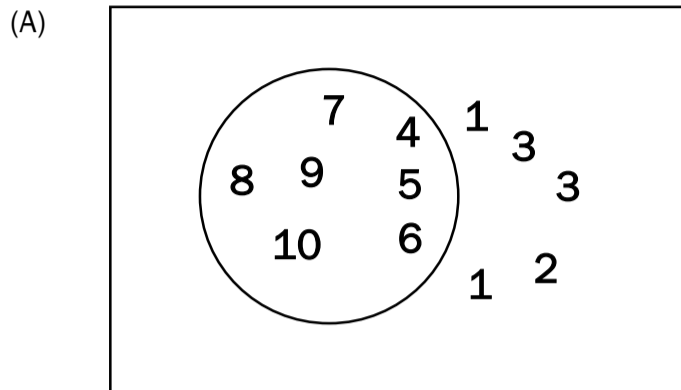
2. The shaded region in which Venn diagram represents  $(A \cup B)'$ , elements in the complement of the union of sets  $A$  and  $B$  ?



3. Which Venn diagram represents the sets  $M$  and  $C$  ?

$$M = \{1, 1, 2, 3, 3, 4, 5, 6\}$$

$$C = \{4, 5, 6, 7, 8, 9, 10\}$$



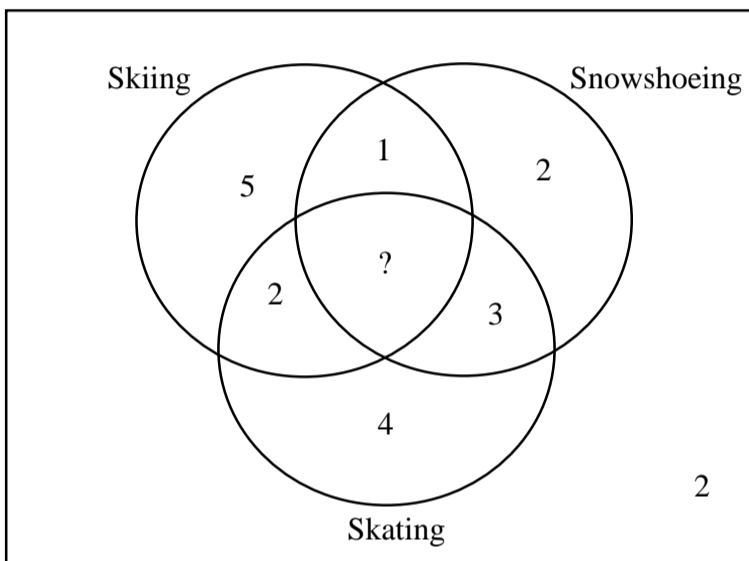
4. There are 30 students in a class.
- 13 are taking chemistry
  - 19 are taking biology
  - 4 are not taking biology or chemistry

How many students are taking chemistry and biology?

- (A) 2  
 (B) 6  
 (C) 28  
 (D) 32

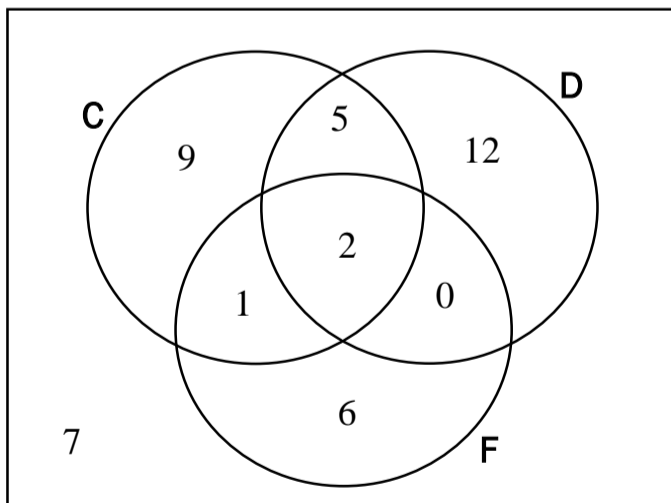
5. The Venn diagram shows the winter activities of 30 students. How many students participated in all three activities?

- (A) 6  
 (B) 11  
 (C) 13  
 (D) 19



6. The Venn diagram shows the number of students that have pets (cats, C; dogs, D; and ferrets; F). Which statement is correct?

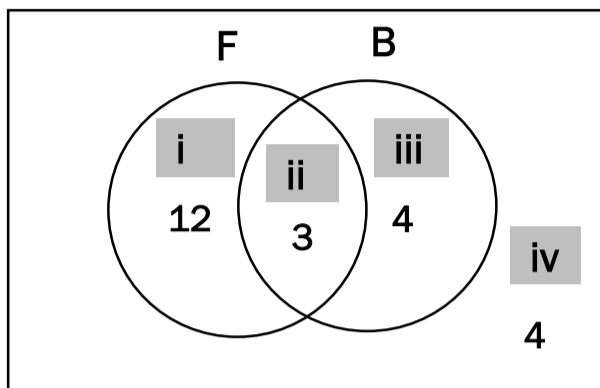
- (A)  $n(C \cap D \cap F) = 8$   
 (B)  $n((D \cap F) \setminus C) = 0$   
 (C)  $n((C \cap F) \setminus D) = 2$   
 (D)  $n(C \cap D \cap F)' = 7$



7. 20 people are on the swim team.
- 12 swim the freestyle (F)
  - 7 swim the butterfly (B)
  - 3 swim the freestyle and the butterfly

Where is the error in the Venn diagram?

- (A) i  
 (B) ii  
 (C) iii  
 (D) iv

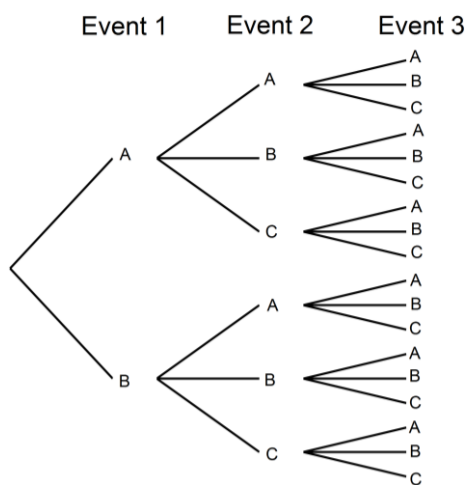


8. A cafeteria offers a lunch time special. A student must choose a drink and a sandwich. Given the selections below, how many choices does the student have?

Drink	Sandwich
Apple Juice	Turkey
Orange Juice	Ham
Milk	Roast Beef
	Chicken

- (A) 7  
 (B) 12  
 (C) 21  
 (D) 42
9. How many 7 digit numbers can be formed using the digits 3, 4, 5, 6, 7, 8, and 9 if the last digit must be prime and repetition is not allowed?
- (A) 1440  
 (B) 2160  
 (C) 2880  
 (D) 5040
10. Anna, Brent, Carl, and Donna are to be arranged in a line from left to right. In how many ways can they be arranged?
- (A)  $1 \times 1 \times 1 \times 1$   
 (B)  $1 + 1 + 1 + 1$   
 (C)  $4 + 3 + 2 + 1$   
 (D)  $4 \times 3 \times 2 \times 1$

11. Given the tree diagram below, what is the total number of outcomes possible if an outcome consists of a selection from Event 1, Event 2, and Event 3 ?



- (A) 3  
 (B) 8  
 (C) 18  
 (D) 26
12. How many ways can 6 students be arranged in a line if Brad and Donna must be together at the back of the line?

- (A)  $4! 2!$   
 (B)  $5!$   
 (C)  $5! 2!$   
 (D)  $6!$

13. Simplify:  $\frac{(n-2)!}{n!}$

- (A)  $\frac{1}{n^2-n}$   
 (B)  $\frac{1}{n^2-1}$   
 (C)  $n^2 - n$   
 (D)  $n^2 - 1$

14. How many different ways can the letters of **S A S K A T O O N** be arranged if you must start with a T and end with a K ?

- (A) 630  
 (B) 5040  
 (C) 45 360  
 (D) 362 880

15. Simplify:  $\binom{n}{3}$

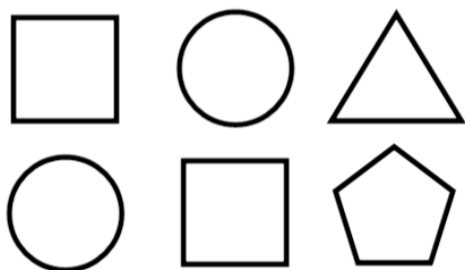
(A)  $\frac{n(n-1)(n-2)}{6}$

(B)  $\frac{n(n-1)(n-2)}{3}$

(C)  $n(n-1)(n-2)$

(D)  $n(n-1)(n-2)(n-3)$

16. If the objects below are placed in a row from left to right, how many different arrangements are possible?



(A) 15

(B) 30

(C) 180

(D) 720

17. The student council has 10 members, 6 girls and 4 boys. A dance committee is to be formed consisting of exactly two girls and two boys. Which calculation could be used to determine the number of different ways this committee could be formed?

(A)  ${}_6C_2 \times {}_4C_2$

(B)  ${}_6P_2 \times {}_4P_2$

(C)  ${}_6C_2 + {}_4C_2$

(D)  ${}_6P_2 + {}_4P_2$

18. If the odds against an event occurring are 9:14, what is the probability of the event occurring?

(A)  $\frac{5}{14}$

(B)  $\frac{9}{23}$

(C)  $\frac{14}{23}$

(D)  $\frac{9}{14}$

19. In one bag, there are 2 white balls and 3 yellow balls. In a second bag, there are 2 green balls and 5 orange balls. One ball is drawn randomly from each bag. Which represents the probability of drawing 1 white ball and 1 green ball?

(A)  $\frac{1}{5} \times \frac{1}{7}$

(B)  $\frac{2}{3} \times \frac{2}{5}$

(C)  $\frac{2}{5} \times \frac{2}{7}$

(D)  $\frac{3}{5} \times \frac{5}{7}$

20. In a state lottery, if you purchase a ticket you choose six different numbers from 1 to 40. If these six numbers match the six numbers drawn by the lottery commission, you win (or share) the top prize. What is the probability of a person with one ticket winning (sharing) the top prize?

(A)  $\frac{1}{40C_6}$

(B)  $\frac{1}{40P_6}$

(C)  $\frac{1}{36!}$

(D)  $\frac{1}{40!}$

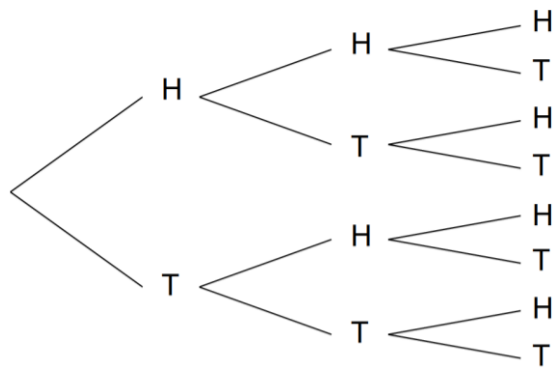


21. A deck of cards consists of four different coloured sets of cards numbered 1 to 8 as shown below. If one card is randomly picked from the deck, what is the probability that the card is green or an even number?

Card Colour	Cards
red	1 2 3 4 5 6 7 8
blue	1 2 3 4 5 6 7 8
green	1 2 3 4 5 6 7 8
yellow	1 2 3 4 5 6 7 8

- (A)  $\frac{1}{4}$
- (B)  $\frac{5}{8}$
- (C)  $\frac{3}{4}$
- (D)  $\frac{7}{8}$
22. A license plate in Newfoundland and Labrador begins with 3 capital letters and ends with 3 digits (0-9). What is the probability that a randomly generated plate ends in the digits 9-1-1 ?
- (A) 0.001
- (B) 0.01
- (C) 0.026
- (D) 0.72
23. A bag contains 5 green marbles, 3 blue marbles, 6 red marbles and 2 yellow marbles. Brittany draws one marble from the bag, then draws another marble without replacing the first one. What is the probability that both marbles she has chosen are red?
- (A)  $\frac{9}{64}$
- (B)  $\frac{1}{30}$
- (C)  $\frac{1}{8}$
- (D)  $\frac{1}{3}$

24. A fair coin is tossed three times. The tree diagram below represents the possible outcomes. What are the odds against tossing two heads and one tail?



- (A) 3:5  
 (B) 3:8  
 (C) 5:3  
 (D) 8:3
25. The letters of the word **A B R A C A D A B R A** are written on cards and placed in a hat. If five cards are chosen from the hat at random, which represents the probability of getting at least one B?

(A)  $\frac{{}_{11}C_1 \times {}_{10}C_4}{{}_{11}C_5}$

(B)  $\frac{{}_{11}C_1 \times {}_{10}C_4 + {}_{11}C_2 \times {}_{10}C_3}{{}_{11}C_5}$

(C)  $\frac{{}_2C_1 \times {}_9C_4}{{}_{11}C_5}$

(D)  $\frac{{}_2C_1 \times {}_9C_4 + {}_2C_2 \times {}_9C_3}{{}_{11}C_5}$

26. What are the non-permissible values for the rational expression  $\frac{x-1}{(3x-2)(x+2)}$ ?

(A)  $\left\{-2, \frac{2}{3}, 1\right\}$

(B)  $\left\{-2, \frac{2}{3}\right\}$

(C)  $\left\{-1, -\frac{2}{3}, 2\right\}$

(D)  $\left\{-\frac{2}{3}, 2\right\}$

27. Which expression has non-permissible values of  $0, -\frac{1}{2}, 3$ ?

(A)  $\frac{2x}{(2x-1)(x+3)}$

(B)  $\frac{2x}{(2x+1)(x-3)}$

(C)  $\frac{2}{x(2x+1)(x-3)}$

(D)  $\frac{2}{x(2x-1)(x+3)}$

28. Which expression is equivalent to  $\frac{x-3}{x+2}$ ,  $x \neq -2$ ?

(A)  $\frac{x^2-3x}{x^2+2x}$

(B)  $\frac{6x-18}{x+2}$

(C)  $\frac{3x-3}{3x+2}$

(D)  $\frac{4x-12}{4x+8}$

29. What is the simplified form of  $\frac{1-2x}{4x^2-1}$ ,  $x \neq -\frac{1}{2}, \frac{1}{2}$ ?

(A)  $\frac{2x}{4x^2}$

(B)  $\frac{-1}{2x}$

(C)  $\frac{1}{2x+1}$

(D)  $\frac{-1}{2x+1}$

30. Simplify:  $\frac{x^3}{5x-x^2}$ ,  $x \neq 0, 5$

(A)  $\frac{1}{5}$

(B)  $\frac{1}{5x}$

(C)  $\frac{x^2}{5-x}$

(D)  $\frac{x^2}{x-5}$

31. Simplify:  $\frac{x^2-100}{x+10} \cdot \frac{x+10}{x(x-10)}$ ,  $x \neq -10, 0, 10$

(A) 10

(B)  $\frac{1}{x}$

(C)  $\frac{10}{x}$

(D)  $\frac{x+10}{x}$

32. Simplify:  $\frac{12x^2}{15} \div \frac{3x^4}{5}$ ,  $x \neq 0$

(A)  $\frac{3x^2}{4}$

(B)  $\frac{4}{3x^2}$

(C)  $\frac{36x^6}{75}$

(D)  $\frac{36x^8}{75}$

33. Simplify:  $\frac{x+3}{2x-3} + \frac{6x-1}{2x-3}$ ,  $x \neq \frac{3}{2}$

(A)  $\frac{7x-2}{2x-3}$

(B)  $\frac{7x+2}{2x-3}$

(C)  $\frac{7x-2}{4x-6}$

(D)  $\frac{7x+2}{4x-6}$

34. Simplify:  $\frac{-5x}{x-7} - \frac{4x}{3x-21}$ ,  $x \neq 7$

(A)  $\frac{-x}{3(x-7)}$

(B)  $\frac{-9x}{3(x-7)}$

(C)  $\frac{-11x}{3(x-7)}$

(D)  $\frac{-19x}{3(x-7)}$

35. Erica can paint her room in 5 hours. If her friend Rachel helps her, they can paint the room together in 3 hours. Which equation can be used to find the time it takes Rachel to paint the room alone?

(A)  $\frac{1}{5} + \frac{1}{x} = \frac{1}{3}$

(B)  $\frac{1}{5} + \frac{1}{3} = \frac{1}{x}$

(C)  $\frac{1}{5} + \frac{1}{x} = 3$

(D)  $\frac{1}{3} + \frac{1}{x} = 5$

**PART II - Total Value: 35 marks**

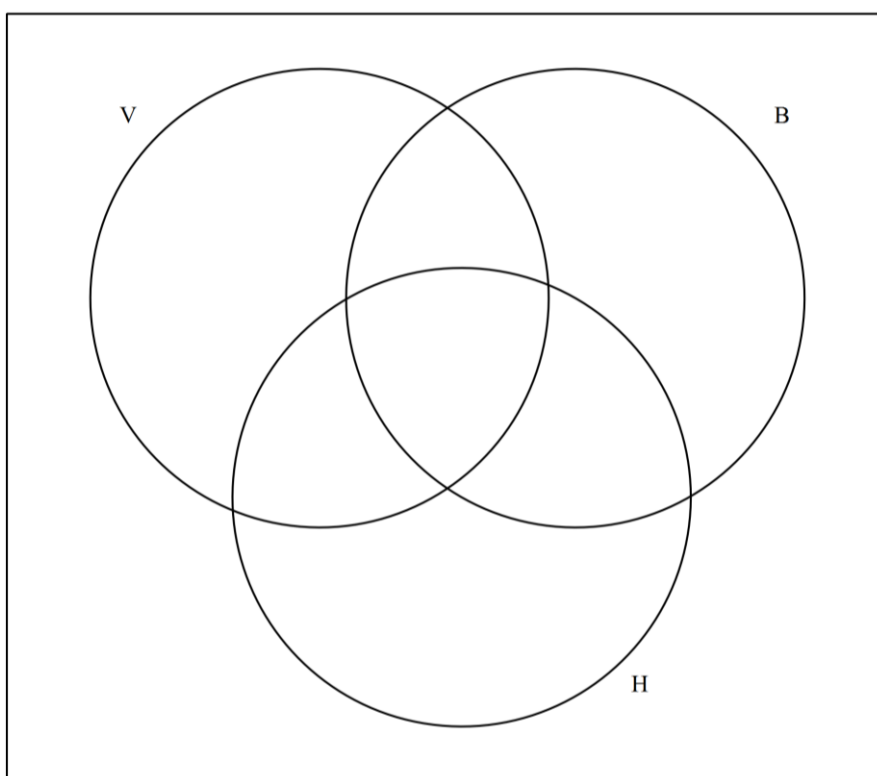
Answer **ALL** items in the space provided. Show **ALL** workings.

Value

3 36(a). There are 79 children who play sports at the recreation centre.

- 20 play volleyball
- 35 play basketball
- 50 play hockey
- 15 play only volleyball and basketball
- 5 play only basketball and hockey
- 2 play all three

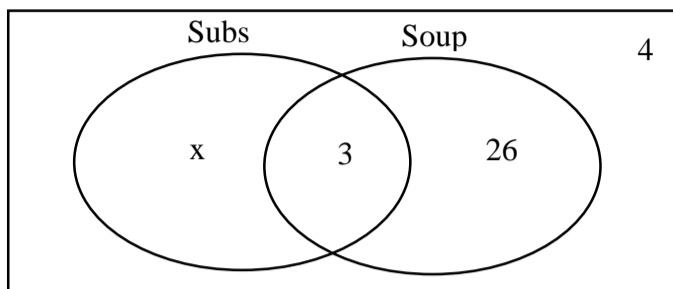
Draw a Venn diagram to illustrate this information and use it to determine how many children just play hockey.



Value

36(b). A student was asked the following question:  
“40 people were surveyed. 26 people like soup, 3 people like both soup and submarine sandwiches, and 4 people like neither. How many people like submarine sandwiches only?”

The student’s solution to the question is shown below:



$$x + 3 + 26 + 4 = 40$$

$$33 + x = 40$$

$$x = 7 \quad ; \quad 7 \text{ people like submarine sandwiches only.}$$

- 1 i) Identify the error in the student’s solution.
  
  
- 2 ii) Algebraically determine the correct solution.

2 37(a). How many different arrangements are there using the letters in the word **CRANBERRIES**? Show your workings.

3 37(b). Algebraically solve for n:  ${}_{n+2}C_2 = 21$

Value

- 3      37(c). There are 5 boys and 6 girls in a club. 5 club members will be selected for a field trip. How many ways can the teacher select 5 members if there must be at most 2 boys?
- 2      37(d). How many numbers greater than 400 are possible using the digits 2, 3, 4, and 5 if repetition is not allowed? Show your workings.
- 3      38(a). Andrew cannot remember the correct order of the six digits in his ID number. He does remember that his number contains the digits 5, 6, 4, 3, 2, and 9. What is the probability that the first three digits of his number are all odd?
- 3      38(b). A computer store advertised its annual half-price sale in the newspaper and on television. A survey of 200 customers indicated that 60 read about the sale in the newspaper, 50 watched the sale advertised on television, and 30 saw the sale through both sources. What is the probability that a randomly selected customer did not see the advertisement in either form?



Value

- 3 38(c). There are 14 girls and 6 boys on the student council at a school. Five students from the student council are to be randomly selected to participate in a local town debate. What is the probability that at least 3 of the students selected are girls?

39(a). Arnold simplified an expression as follows:

$$\begin{aligned} & \frac{2x}{x^2 - 4} + \frac{7}{2x - 4} \\ &= \frac{2x}{(x+2)(x-2)} + \frac{7}{2(x-2)} && \text{Step 1} \\ &= \frac{2x}{(x+2)(x-2)} + \frac{7}{2(x-2)} && \text{Step 2} \\ &= \frac{x}{(x+2)(x-2)} + \frac{7(x+2)}{(x-2)(x+2)} && \text{Step 3} \\ &= \frac{x+7x+14}{(x+2)(x-2)} && \text{Step 4} \\ &= \frac{8x+14}{(x+2)(x-2)} && \text{Step 5} \end{aligned}$$

- 1 (i) Identify the step in which the error occurred and explain the mistake.
- 3 (ii) Correct the errors and simplify.

Value

2      39(b). Simplify:  $\frac{x+5}{7x+14} \div \frac{x^2-25}{10(x+2)}$  ,  $x \neq -5, -2, 5$

- 4      39(c). A school group is going on a field trip. The total cost is \$900. If 10 more students sign up, the price per student will decrease by \$15. If  $x$  represents the number of students and the situation is modelled by the equation  $\frac{900}{x} - \frac{900}{x+10} = 15$  , algebraically determine how many students are going on the field trip.